

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Heon Moo Kim et al. )  
Serial No.: 10/ 580,102 ) Group Art Unit:  
Filed: January 26, 2005 ) 1794  
For: BIODEGRADABLE STARCH BOWL AND )  
METHOD FOR PREPARING THE SAME ) Examiner:  
KASHNIKOW, ERIK

VIA EFS

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

DECLARATION UNDER 37 CFR § 1.132

I, Heon Moo Kim of Jugong Apt. 338-508, #552, Cheolsan-dong, Kwangmyeong-si, Kyeonggi-do 423-733 of the Republic of Korea, declare(s) that:

1. I am an inventor of the above-referenced U.S. Patent Application serial number 10/ 580,102, herein referred to as the Application, assigned to the YOUL CHON CHEMICAL CO., LTD., having a place of business at 370-1 SINDAEBANG-DONG, DONGJAK-GU, SEOUL, REPUBLIC OF KOREA.

2. I graduated from MYONGJI UNIVERSITY with a MASTER'S DEGREE in CHEMICAL ENGINEERING on DECEMBER 8, 2006.

3. Since March 5, 1986, I have been employed YOUL CHON CHEMICAL CO., LTD., and have been engaged in the research and development of biodegradable starch bowls.
4. I hereby state that I have direct knowledge and understanding of the materials and procedures that were used in the preparation of the Examples for the above-identified Application.
5. I hereby also state that I am aware of the outstanding rejection of the Application found in the outstanding Office Action dated April 2, 2010 for the Application.
6. The invention of the Application relates to a biodegradable starch bowl and a method for preparing the same. The biodegradable starch bowl in the prior art still has the problem that the bowl does not have enough long-term preservative property, sterilizing and deodorizing properties to be desired(Referring to [0009] of the present specification).
7. However, a biodegradable starch bowl according to the Application can have all the effective advantages in the molding property, strength of the bowl, stench, color change, sterilizing and deodorizing effect, and the preservative properties by comprising unmodified starch, pulp fiber powder having a fiber length of more than 50 to 200 $\mu$ m, solvent, photo catalyst(Fe(III) doped titanium dioxide or titanium dioxide which an anatase content is 70% or more) and preservative(potassium sorbate or sodium benzoate) in a prescribed ratio(referring to Table 10 and 11 of the present specification).
8. The constituents comprising in the composition claimed in claims 1, 32, 33 and 34 are as follows:

[Table 1]

	Claim 1		Claim 32		Claim 33		Claim 34	
1	unmodified starch	20-60 wt%	unmodified starch	20-60 wt%	unmodified starch	20-60 wt%	unmodified starch	20-60 wt%
2	pulp fiber powder	5-30 wt%	pulp fiber powder	5-30 wt%	pulp fiber powder	5-30 wt%	pulp fiber powder	5-30 wt%
3	solvent	30-60 wt%	solvent	30-60 wt%	solvent	30-60 wt%	solvent	30-60 wt%
4	Fe(III) doped titanium dioxide	0.5-2.0 wt%	titanium dioxide which an anatase content is 70% or more	0.5-2.0 wt%	Fe(III) doped titanium dioxide	0.5-2.0 wt%	titanium dioxide which an anatase content is 70% or more	0.5-2.0 wt%
5	potassium sorbate	more than 0.1 to less than 0.5 wt%	potassium sorbate	more than 0.1 to less than 0.5 wt%	sodium benzoate	0.2 or equal to less than 0.5 wt%	sodium benzoate	0.2 or equal to less than 0.5 wt%

9. The biodegradable starch bowls claimed in claims 1, 32, 33 and 34(the present invention) is prepared by heating and pressurizing a composition comprising titanium dioxide which an anatase content is 70% or more or Fe(III) doped titanium dioxide as a photo catalyst, and the amount of the photo catalyst is 0.5-2.0 wt% based on the total amount of the composition.

10. This is because the molding property and the strength of the bowl may be reduced if the amount of photo catalyst added is too much and it is difficult to exhibit the sterilizing and deodorizing effects if the amount of photo catalyst added is too small(Referring to [0058] of the present specification).

11. The Examiner is of the position that it is obvious for the one skilled in the art to improve the sterilizing effects by using the photo catalyst. However, the present invention is

not a biodegradable starch bowl prepared from a composition simply comprising the photo catalyst, but a biodegradable starch bowl prepared from a composition comprising the prescribed amount of photo catalyst considering the aspect of molding property and compressive strength to satisfy the physical properties required for the biodegradable starch bowl.

12. Specifically, the biodegradable starch bowl are prepared by mixing the compositions as shown in Tables 2 to 5 in a double jacket heating agitator for 20 minutes, as described in [0080] of the present specification(Examples 1 to 8), and the evaluation of molding property and compressive strength as well as the sterilizing and deodorizing effects of the molded bodies comprising titanium dioxide in which the anatase content is 70% or more or Fe(III) doped titanium dioxide in an amount of 0.5-2.0 wt% was performed.

[Table 2] (Referring to Table 4 of the present specification)

constituents	Test 1	Test 2	Test 3	Test 4
Natural polymer	36.7	36.7	36.7	36.7
Pulp fiber powder	9.9	9.9	9.9	9.9
Fe-doped TiO <sub>2</sub>	0.5	1	2	2.5
Preservative (potassium sorbate)	0.2	0.2	0.2	0.2
Water	52.5	52.0	51.0	50.5
Total	100	100	100	100

[Table 3] (Referring to Table 3 of the present specification)

constituents	Test 5	Test 6	Test 7	Test 8
Natural polymer	36.7	36.7	36.7	36.7
Pulp fiber powder	9.9	9.9	9.9	9.9
titanium dioxide anatase content is 70% or more	0.5	1	2	2.5
Preservative (potassium sorbate)	0.2	0.2	0.2	0.2
Water	52.5	52.0	51.0	50.5

Total	100	100	100	100
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[Table 4]

constituents	Test 9	Test 10	Test 11	Test 12
Natural polymer	36.7	36.7	36.7	36.7
Pulp fiber powder	9.9	9.9	9.9	9.9
Fe-doped TiO <sub>2</sub>	0.5	1	2	2.5
Preservative (potassium sorbate)	0.4	0.4	0.4	0.4
Water	50.5	50.5	50.5	50.5
Total	100	100	100	100

[Table 5]

constituents	Test 13	Test 14	Test 15	Test 16
Natural polymer	36.7	36.7	36.7	36.7
Pulp fiber powder	9.9	9.9	9.9	9.9
titanium dioxide anatase content is 70% or more	0.5	1	2	2.5
Preservative (potassium sorbate)	0.4	0.4	0.4	0.4
Water	50.5	50.5	50.5	50.5
Total	100	100	100	100

13. The results are described in Table 6.

[Table 6] (Referring to Table 10 of the present specification)

Test	molding property	compressive strength	stench	color change	sterilizing effect	Deodorizing effect	Preservative property
1	◎	◎	N	N	100%	100%	◎
2	◎	◎	N	N	100%	100%	◎
3	◎	◎	N	N	100%	100%	◎
4	x	○	N	N	100%	100%	◎
5	◎	◎	N	N	100%	100%	◎
6	◎	◎	N	N	100%	100%	◎
7	◎	◎	N	N	100%	100%	◎
8	x	○	N	N	100%	100%	◎

9	◎	◎	N	N	100%	100%	◎
10	◎	◎	N	N	100%	100%	◎
11	◎	◎	N	N	100%	100%	◎
12	x	O	N	N	100%	100%	◎
13	◎	◎	N	N	100%	100%	◎
14	◎	◎	N	N	100%	100%	◎
15	◎	◎	N	N	100%	100%	◎
16	x	O	N	N	100%	100%	◎

14. The results for evaluating the molding property and compressive strength show that the molding property and compressive strength are ◎, when the composition comprises titanium dioxide having an anatase content of 70% or more or Fe(III) doped titanium dioxide in an amount of 0.5-2.0 wt% based on the total amount of the composition. However, when the composition comprises more than 2.0 wt% of titanium dioxide(in this case 2.5 wt%), the molding property and compressive strength are respectively x, so that the composition cannot represent the molding property and compressive strength enough to satisfy the requirements for the biodegradable starch bowl.

15. When the molded bowls are prepared from the composition comprising titanium dioxide in which anatase content is 70% or more or Fe(III) doped titanium dioxide in an amount of 0.5-2.0 wt% based on the total amount of the composition, the molded bowls have surfaces which are smooth and have no wrinkles or pinholes(◎: referring to [0101] of the present specification). However, the molded bowls are prepared from the composition comprising titanium dioxide in which the anatase content is 70% or more or Fe(III) doped titanium dioxide in an amount of more than 2.0 wt%, the molded bowls has wrinkles or pinholes, and thus molding is difficult(x: referring to [0101] of the present specification).

16. Further, I identified that when the molded bowls are prepared from the composition comprising titanium dioxide in which anatase content is 70% or more or Fe(III) doped titanium dioxide in an amount of 0.5-2.0 wt% based on the total amount of the composition, the molded bodies show  $\odot$ , which means that the molded bowls have such significant compressive strength that the molded bowls do not have any fracture when both surfaces of the bowl are compressed with above  $5 \text{ kgm/s}^2$  of the strength using a load cell at a speed of 2 mm/s(referring to [0102] of the present specification). Unlike the foregoing, when the molded bowls are prepared from the composition comprising titanium dioxide in an amount of more than 2.0 wt%, the molded bowls are finally broken in the case where both surfaces of the bowl are compressed with  $3.5 \text{ kgm/s}^2$  of the strength.

17. Based on the data described above, I acknowledged that titanium dioxide in which anatase content is 70% or more or Fe(III) doped titanium dioxide in an amount of 0.5-2.0 wt% can affect the molding property and compressive strength which are required for the biodegradable starch bowl, as well as the sterilizing and deodorizing effect.

18. When the composition comprises titanium dioxide in which anatase content is 70% or more or Fe(III) doped titanium dioxide in an amount of 0.5-2.0 wt% based on the total amount of the composition, the effects that the molding property and compressive strength can be fully improved are unique to the present invention, and unexpected from the prior arts.

19. Further, the present invention comprises potassium sorbate or sodium benzoate, and the amount of potassium sorbate is more than 0.1 to less than 0.5 wt% based on the total amount of the composition or the amount of the sodium benzoate is more than 0.2 or equal to less

than 0.5 wt% based on the total amount of the composition. The stench and the color change can be prevented, and the preservative property can be improved by composition comprising potassium sorbate or sodium benzoate in the above claimed range.

20. The Examiner has the position that it is obvious for the one skilled in the art to provide the preservative property with the biodegradable starch bowl by using potassium sorbate or sodium benzoate. However, the present invention is not the biodegradable starch bowl simply prepared from a composition comprising the preservatives, but the biodegradable starch bowl prepared from a composition comprising the prescribed amount of the preservatives considering the aspect of prevention of the stench and the color change.

21. Specifically, the biodegradable starch bowl is prepared by mixing the compositions as shown in Tables 7 to 10 in a double jacket heating agitator for 20 minutes, as described in [0080] of the present specification(Examples 9 to 12 and Comparative Examples 21 to 24), and the evaluation of the stench and the color change as well as the preservative property of the molded bowls comprising potassium sorbate of more than 0.1 to less than 0.5 wt% or sodium benzoate of more than 0.2 or equal to less than 0.5 wt% was performed.

[Table 7]

constituents	Test 17	Test 18	Test 19	Test 20
Natural polymer	36.7	36.7	36.7	36.7
Pulp fiber powder	9.9	9.9	9.9	9.9
titanium dioxide anatase content is 70% or more	0.5	0.5	0.5	0.5
Preservative (potassium sorbate)	0.05	0.1	0.5	1.0
Water	52.85	52.8	52.4	51.9
Total	100	100	100	100



[Table 8]

constituents	Test 21	Test 22	Test 23	Test 24
Natural polymer	36.7	36.7	36.7	36.7
Pulp fiber powder	9.9	9.9	9.9	9.9
titanium dioxide anatase content is 70% or more	0.5	0.5	0.5	0.5
Preservative (sodium benzoate)	-	0.1	0.2	0.5
Water	52.9	52.8	52.7	52.4
Total	100	100	100	100

[Table 9]

constituents	Test 25	Test 26	Test 27	Test 28
Natural polymer	36.7	36.7	36.7	36.7
Pulp fiber powder	9.9	9.9	9.9	9.9
titanium dioxide anatase content is 70% or more	2.0	2.0	2.0	2.0
Preservative (potassium sorbate)	0.05	0.1	0.5	1.0
Water	51.35	51.3	51.25	51.2
Total	100	100	100	100

[Table 10]

constituents	Test 29	Test 30	Test 31	Test 32
Natural polymer	36.7	36.7	36.7	36.7
Pulp fiber powder	9.9	9.9	9.9	9.9
titanium dioxide anatase content is 70% or more	2.0	2.0	2.0	2.0
Preservative (sodium benzoate)	-	0.1	0.2	0.5
Water	51.4	51.3	51.2	50.9
Total	100	100	100	100

22. The results are described in Table 11.

[Table 11]

Test	molding property	compressive strength	stench	color change	sterilizing effect	Deodorizing effect	Preservative property
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17	◎	◎	N	N	100%	100%	x
18	◎	◎	N	N	100%	100%	O
19	◎	◎	Y	Y	100%	100%	◎
20	◎	◎	Y	Y	100%	100%	◎
21	◎	◎	N	N	100%	100%	x
22	◎	◎	N	N	100%	100%	x
23	◎	◎	N	N	100%	100%	O
24	◎	◎	Y	Y	100%	100%	O
25	◎	◎	N	N	100%	100%	x
26	◎	◎	N	N	100%	100%	O
27	◎	◎	Y	Y	100%	100%	◎
28	◎	◎	Y	Y	100%	100%	◎
29	◎	◎	N	N	100%	100%	x
30	◎	◎	N	N	100%	100%	x
31	◎	◎	N	N	100%	100%	O
32	◎	◎	Y	Y	100%	100%	O

23. The results for evaluating the preservative property show that the preservative property is significantly improved as represented by ◎, when the composition comprises potassium sorbate of more than 0.1 to less than 0.5 wt%. ◎ means that fungi did not occur while more than 30 days have passed, even though the bowl is contaminated with fungi by putting the bowl in a thermohydrostat having conditions of 30℃ and a relative humidity of 90%(referring to [0109] of the present specification). However, when the composition comprises less than 0.1 wt%, fungi occurred in 20 days, which means that the preservative property is x(Test 17).

24. In addition to the preservative property, the stench and the color change of the bowl can be prevented by comprising potassium sorbate of more than 0.1 to less than 0.5 wt%, and the prevention of the stench and the color change of the bowl are unexpected from the prior

arts. The stench meaning nasty smell from the bowl besides a unique smell of starch and the color change meaning color of the bowl is dark brown when compared with that of a standard composition are separate properties from the preservative property(referring to [0103] and [0104] of the present specification). When the composition comprises 0.5 wt% or more of potassium sorbate, the stench and the color change occurred (Test 19 and 20) even though the preservative property may be improved, so the biodegradable starch bowl cannot have the desired properties.

25. Further, when the composition comprises more than 0.2 or equal to less than 0.5 wt% of sodium benzoate, the composition can show the effects preventing the stench and the color change derived from the bowl which are unexpected from the prior arts as well as the improved preservative property. When the composition comprises less than 0.2 wt% of sodium benzoate, the preservative property is x, which means that fungi occurs in 20 days after the bowl is contaminated with fungi(Test 21 and 22). Further, when the composition comprises of 0.5 wt% or more of sodium benzoate, the stench and the color change occurred, even though the preservative property may be improved(Test 24).

26. I acknowledged that potassium sorbate of more than 0.1 to less than 0.5 wt% or sodium benzoate of more than 0.2 or equal to less than 0.5 wt% in the composition can affect the prevention of the stench and the color change, as well as the preservative property.

27. Based on the foregoing, when potassium sorbate of more than 0.1 to less than 0.5 wt% or sodium benzoate of more than 0.2 or equal to less than 0.5 wt% is included in the composition, the effects that the stench and the color change can be fully prevented are unique

to the present invention, and unexpected from the prior arts.

28. The present invention has a distinctive feature in comprising the photo catalyst(titanium dioxide in which anatase content is 70% or more or Fe(III) doped titanium dioxide) and the preservative in a prescribed amount as claimed, and the present invention may provide all the effective advantages in the molding property, strength of the bowl, the stench, color change, the sterilizing and deodorizing effect and the preservative properties via the constituents described above. None of the prior arts disclose the unexpected effects regarding the stench, color change, the sterilizing and deodorizing effect achieved by combining the photo catalysts and the preservatives in a prescribed ratio and the unexpected effects for the biodegradable starch bowl by comprising the constituents in a prescribed ratio are unique to the present invention. Therefore, the inventiveness of the present invention cannot be denied by the prior arts which do not disclose the constituents of the present invention, or the unexpected effects derived from the constituents.

29. The undersigned declares that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

Date: July 2<sup>nd</sup>, 2010

Heon Moo Kim